

**Project title: Interactive conference, “NITROGEN LOSSES TO THE ATMOSPHERE  
FROM LIVESTOCK AND POULTRY OPERATIONS.”  
GRANT NUMBER: LP03-212**

Report to Indiana Commissioner of Agriculture  
Livestock and Development Fund  
FOR EXPANDING MARKETS FOR INDIANA LIVESTOCK PRODUCERS  
by American Dairy Science Association (ADSA)  
Bill R. Baumgardt, DISCOVER Conference Coordinator

**Summary Report:**

The Sixth DISCOVER Conference on Food Animal Agriculture: Nitrogen Losses to the Atmosphere from Livestock and Poultry Operations can be deemed a success. A final registration of 120 far exceeded our goal of 100, attracting top individuals from the research community as well as the livestock industries, regulatory agencies, and other institutions responsible for the education, development and implementation of policy.

**1. Review of Progress Toward All Project Objectives**

Keeping with the DISCOVER Conference model, the objective of this conference was to bring together a group of people with diverse talent and experience relevant to volatile nitrogen emissions from livestock and poultry so that we can better understand the nature of the problem, and identify measures that can be developed and implemented to mitigate problems where problems exist.

Interpretive Summaries: Each participant received a notebook containing speaker bios and contact information and copies of their presentations. New at this conference is the addition of Speaker Interpretive Summaries, where each speaker was asked to write a brief summary of their talk in laymen's terms that includes contact information. These Interpretive Summaries were included in the notebooks and have been posted on the conference web site. Press releases include the URL to the summaries. Discussions with the attendees revealed they are pleased with the addition of these summaries.

Web Site: The DISCOVER Conference Series has a page on the ADSA Web site ([www.adsa.org/discover/](http://www.adsa.org/discover/)). The web site serves as a valuable communication tool, providing conference details such as the program, donors, and trip planning information. New to this conference is the addition of the Speaker Interpretive Summaries, where individuals visiting the site can actually view a summary of each speaker's talk and their contact information.

Reaching Beyond Our Standard Audience: Livestock and poultry emissions have been an area of concern to the industry and to environmentalists alike. The U.S. Environmental Protection Agency has commissioned a study of air emissions from confined livestock and poultry operations by the National Academy of Sciences. To help better identify the problem, understand the wide array of issues (both environmental and regulatory), and provide some leadership toward minimizing emissions, the program committee recognized the need to look beyond our standard audience both domestically and abroad. Invited speakers and attendees included EPA regulators, IDEM representatives, agricultural engineers, USDA researchers, specialists from targeted states, as well as those working in such heavily-regulated areas as Denmark, Holland, Sweden, UK and elsewhere abroad. The planning committee felt this diverse mix was essential in order to gain a strong handle on the issues and perhaps aid the EPA in their study. Having this

conference in Indiana enabled several Indiana folks, including some from IDEM, to participate, thus capturing the information for the direct benefit of Indiana.

Reaching our Objectives: Bringing together a group of people with diverse talent and experience, while sometimes daunting, proved to be the key to the success of this conference. The participant survey indicated representation from the following institution types: 55% university, 17% governmental agency, 13% company, 6% producer, 1% consultant, 5% other, 3% n/a. The survey also indicated that more than 60% were not members of ADSA. Survey comments clearly showed that the wide array of participants played a key role in the success of this conference.

2. Subject Matter (Technical) Summary of the conference is provided in an Appendix: "Summary Statement from the 6<sup>th</sup> Discover Conference"

### 3. Evaluation and Likely Impact

Participant Evaluation: An evaluation form was included in the attendee notebook. Of the 120 in attendance, we received a total of 63 completed evaluation forms were returned. Attendees were asked to rate the conference on a session-by-session basis. On average, sessions were rated Very Good to Excellent. When asked their opinion of the overall concept of the DISCOVER Conference, respondents gave it an Excellent rating. Comments included: "This was a great conference. A great broad overview. Whoever picked the speakers did an excellent job;" " EXCELLENT CONFERENCE;" "Very valuable. I will be able to use a lot of these important concepts there were reinforced at this conference in discussion with my management and the regulated community. Thanks!" Also, many suggested follow up conferences on related subjects or extended discussions on various aspects of the emissions issue. The complete survey results are available upon request.

Likely Impact: Livestock and poultry operations account for 60-80% of the ammonia released to the atmosphere in the United States. Volatilized ammonia leads to acid rain, combines with other nitrogen and sulfur pollutants to form small air-borne particles that reduce air quality and threaten human health, and results in nitrogen deposition and over-fertilization of fragile ecosystems. In addition to ammonia, nitrous oxide is emitted from livestock operations. Nitrous oxide is a potent greenhouse gas. Clearly, the stakes are high for the livestock industry.

Concern over this issue is shared by the US EPA, who commissioned a study of air emissions from confined livestock and poultry operations by the National Academy of Sciences. This report is due in October 2002. Participants in the group commissioned for this study were participants in our conference. It is our hope that the information shared at this conference will be useful to them as they complete their study and prepare their report to the EPA. Additionally, representatives from the EPA were a part of our conference.

This conference will have even further lasting effects on research programs both in progress and under development. The conference roster was composed of a number of individuals new to the area of volatile emissions who are currently developing research programs. The conference presented a chance to bring these people up to speed and to introduce them to individuals heavily entrenched in the topic area. There was also a sizable component of registrants for whom this topic is their primary focus of research. For them, face-to-face interaction with their peers provided new and renewed lines of communication.

This DISCOVER Conference presented competent information that will influence current research programs. Further, it will expedite the planning and development of future research programs. The timing of this conference was ideal, and the topic will be at the heart of important (regulatory and other) decisions for the livestock industry.

Report submitted by:  
Bill Baumgardt, Coordinator, ADSA Discover Conferences  
P.O. Box 2180  
West Lafayette, IN 47906  
Ph: 765-463-4249

QuickTime® and  
PDF documents may require  
additional software to view.

Date: November 22, 2002

## **APPENDIX: Technical Summary for Final Report Grant LP03-212**

### **Summary Statement from the 6<sup>th</sup> Discover Conference**

#### **“Nitrogen Losses to the Atmosphere from Livestock and Poultry Operations”**

Livestock and poultry operations account for 60-80 % of the ammonia released to the atmosphere in the United States. Global ammonia emissions to the atmosphere in pre-industrial times were 30-40% of current amounts.

Ammonia reacts with nitrogen and sulfur oxides in the atmosphere to produce small air-borne particles that reduce visibility and which can cause lung damage. The oxides are produced mainly by electrical power plants and internal combustion engines. The role of ammonia in achieving improved air quality is likely to become more important in coming years as sulfur oxide emissions from combustion processes decrease.

Nitrogen deposited from atmospheric sources is over-fertilizing some fragile environments. Deposition rates close to 50 lb of nitrogen per acre have been measured in southern California, resulting in increased biomass of exotic grasses at the expense of native shrubs and possible increase in the incidence and severity of grass fires.

A variable portion of the nitrogen excreted by animals (about 2%) is emitted to the atmosphere as nitrous oxide. Nitrous oxide is approximately 310 times as effective as carbon dioxide (per unit weight) in its global warming effect. Nitrous oxide is the largest component of green house gases emitted by livestock.

While odor, hydrogen sulfide, or manure discharges (leaks) to the environment are the primary issues in some parts of the United States, release of ammonia and volatile organic compounds from dairy facilities in California is prominent in the public debate on air quality. Limits on release of ammonia and volatile organic compounds from livestock facilities either are or will likely limit expansion of the California dairy herd in some locations.

A number of methodologies are used for measuring nitrogen emissions from livestock facilities. These range from simple ammonia absorption devices to very sensitive spectroscopic techniques. While great care must be used in standardizing the measurement procedure, a sufficient variety of techniques are available to permit reasonably accurate estimates of nitrogen emission.

Mass balance calculations of nitrogen emission from beef feedlots suggest that 50-65% of excreted nitrogen is lost to the atmosphere, or roughly 60-80 lb per steer per year. Ammonia losses from open lot dairies in California, including the slurry manure storage, are about 80 lb per cow per year. Emission of ammonia for market hogs ranges between 19 and 30 lb per pig per year. Poultry ammonia emissions appear to be in the range of .5 to .6 lb per bird per year.

Reducing dietary protein can be an effective way to reduce volatile nitrogen losses from manure. Many beef and dairy diets, with proper ration balancing and grouping of animals according to age or level of production, can lead to dietary protein reduction of 10-15%, thus reducing excreted nitrogen by 15-20%. Most of the reduction in excreted nitrogen will be in urinary nitrogen, and it is urinary nitrogen that is most vulnerable to loss to the atmosphere.

There is opportunity to reduce dietary nitrogen in swine diets without increasing cost of formulation, but it will be more difficult. Reduction of dietary protein will reduce volatile nitrogen losses from swine operations just as it does with beef and dairy.

Nitrogen excretion by poultry can be reduced substantially by diet modification. However, such diet modifications generally reduce growth or increase cost. Thus, the poultry industry needs to have economic incentives to implement feeding practices that are specifically designed to reduce nitrogen excretion.

There are steps that can be taken to reduce volatile nitrogen loss from animal and manure storage facilities. Some of the measures, however, are difficult to justify from a cost perspective.

Approaches include:

- Separation of feces and urine by modifying barn floor or use of belt or scraper systems to effect separation of urine and feces.
- Frequent scraping of barn floor.
- Deep manure storage pits with a minimum of exposed surface area.
- Covering manure storage.
- Use of alum and aluminum chloride to reduce ammonia loss by 70% in chicken litter.
- Use of constructed wetlands to convert manure nitrogen forms into nitrogen gas.
- Reducing manure pH through direct acidification or through use of feed additives.
- Bio-filters to remove ammonia from building exhaust air.

Effective field application methods are needed if farmers are to depend on manure as a nutrient source. Significant loss (~50%) of ammonia nitrogen can occur with splash plate application of slurry manure to the soil surface. Banding of manure with a sleigh foot is a low-cost way to apply manure uniformly in all weather. Banding manure with a soil aerator (Aerway) on grassland reduces ammonia emissions by 45-50% and odor by 36% when compared to splash plate application.

Loss of ammonia gas from field-applied manure is affected by characteristics of the manure; the weather during and after manure application, presence of a growing crop, condition of the soil, and length of time manure is exposed to the atmosphere. The best way to minimize ammonia losses is to incorporate the manure during or immediately after application.

Public perception is what drives regulatory action in the area of environmental protection. However, there is a role for scientists, economists, and other experts. Science and technology create the options for reducing environmental damage and gauge their effectiveness. Transparency, reliable measurements, establishment of a baseline, and monitoring become critical components of the process. Economists indicate the cost effectiveness of the different approaches.